

adjusting the length of light guide member [205] 305. At this time, although there may be some difference depending on the kind [of image] of image forming apparatus, about 18 LEDs are required for the conventional image forming apparatus to perform the pre-transfer operation whereas, in the image forming apparatus according to the present invention, a sufficient pre-transfer effect can be obtained with about two or three LEDs 304.

Further, the light emitted from LED 304 is guided by light guide member 305 to photosensitive drum 302 so that the installation angle of PTL 301 is not restricted by changing the path of light guide member 305. Therefore, the installation of PTL 301 becomes very convenient.

The pre-transfer system of the image forming apparatus in accordance with the present invention has advantages as follows. Since the PTL is installed upstream of the delivering path of the paper and the light emitted from the PTL directly reaches the surface of the photosensitive drum, the clarity of the image and the pre-transfer efficiency is enhanced.

Further, since the PTL is installed upstream of the delivering path of the paper, and the light emitted from the PTL is reflected by the reflection mirror and then reaches the surface of the photosensitive drum, the installation of the PTL is not restricted.

In addition, since the PTL is installed upstream of the delivering path of the paper and the light emitted from the PTL is guided by the light guide member to the surface of the photosensitive drum, the installation of the PTL is not restricted.

Moreover, since the distance between the PTL and the photosensitive drum is sufficient, a high re-transfer efficiency is obtained with only a few LEDs.

Although the invention has been shown and described with respect to the preferred embodiments according to the present invention, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims. Therefore, the present invention should not be limited to the described embodiments and is defined by the appended claims and the equivalent thereof.

What is claimed is:

1. An image forming apparatus, comprising an electrification roller electrifying a surface of a photosensitive drum, a laser scan unit forming an electrostatic latent image on the surface of the photosensitive drum, a developing machine making the electrostatic latent image visible, a pre-transfer lamp reducing the potential of toner coated on the photosensitive drum, a transfer roller transferring the image to a recording paper, and a fixer fixing the image transferred to the recording paper;

wherein the pre-transfer lamp is placed upstream of a delivering path of the recording paper;

wherein a lens is disposed opposite to a light emitting portion of the pre-transfer lamp, the lens spreading light emitted from the pre-transfer lamp in a scanning direction of the photosensitive drum and, at the same time, collecting the light in a direction perpendicular to the scanning direction; and wherein a guide member is disposed at an angle with respect to the lens and the photosensitive drum, the guide member guiding the light spread and collected by the lens toward the surface of the photosensitive drum.

2. The apparatus according to claim 1, wherein the pre-transfer lamp is placed in a direction perpendicular to the delivering path of the paper.

3. The apparatus according to claim 1, wherein the lens is formed as a unit, the lens having a flat face for refracting the light emitted from the pre-transfer lamp to form parallel light, and a semicircular face opposite to the flat face for spreading the light in the scanning direction and, at the same time, collecting the light in a direction perpendicular to the scanning direction, the lens extending in the scanning direction.

4. The apparatus according to claim 1, wherein the guide member is a reflection mirror.

5. An image forming apparatus, comprising an electrification roller electrifying a surface of a photosensitive drum, a laser scan unit forming an electrostatic latent image on the surface of the photosensitive drum, a developing machine making the electrostatic latent image visible, a pre-transfer lamp reducing the potential of toner coated on the photosensitive drum, a transfer roller transferring the image to a recording paper, and a fixer fixing the image transferred to the recording paper;

wherein the pre-transfer lamp is placed upstream of a delivering path of the recording paper; and

wherein a light guide member is disposed between the pre-transfer lamp and the photosensitive drum, the light guide member guiding light emitted from the pre-transfer lamp toward the surface of the photosensitive drum, and spreading the light in a scanning direction while, at the same time, collecting the light in a direction perpendicular to the scanning direction.

6. The apparatus according to claim 5, wherein the pre-transfer lamp is placed parallel to the recording paper, a light emitting face of the pre-transfer lamp being disposed facing toward the photosensitive drum.

7. The apparatus according to claim 5, wherein the light guide member is formed as a unit, and has two end faces of a semicircular shape, a first end face being opposite to the pre-transfer lamp for receiving and spreading the light emitted from the pre-transfer lamp, and a second end face being opposite to the photosensitive drum for spreading the light in the scanning direction and, at the same time, collecting the light in a direction perpendicular to the scanning direction, the light guide member extending in the scanning direction.

8. The apparatus according to claim 7, wherein the light guide member is made of a plastic material and has an interior which is empty.

9. An image forming apparatus, comprising:

- a photosensitive drum for holding an electrostatic latent image and receiving toner;
- a developing roller for applying the toner to the photosensitive drum;
- a transfer roller contacting the photosensitive drum for transferring the toner from the photosensitive drum to a recording medium;
- a recording medium delivering path extending downstream from a pickup roller toward a nip between said photosensitive drum and said transfer roller; and
- a pre-transfer lamp located on a same side of the recording medium delivering path as the photosensitive drum, and located upstream of the photosensitive drum, for spreading light in a scanning direction onto the photosensitive drum; wherein said pre-transfer lamp comprises a first light-emitting diode and a mirror for directing the light from the first light-emitting diode toward the photosensitive drum.

10. The image forming apparatus of claim 9, said first light-emitting diode being oriented generally toward the recording medium delivering path.

11. The image forming apparatus of claim 9, said pre-transfer lamp further comprising a lens disposed between the first light-emitting diode and the mirror for spreading the light along the scanning direction, and for focusing the light perpendicular to the scanning direction, onto the photosensitive drum.

12. The image forming apparatus of claim 13, said lens having an elongate flat face facing the first light-emitting diode and a semi-cylindrical face opposite the flat face.

13. The image forming apparatus of claim 12, said pre-transfer lamp further comprising a second light-emitting diode positioned facing a portion along a length of the flat face of said lens different from a portion faced by said first light-emitting diode, said second light-emitting diode supplementing illumination of a scanning region of the photosensitive drum.

14. The image forming apparatus of claim 12, wherein there are three light-emitting diodes positioned along a length of the flat face of said lens.

15. An image forming apparatus, comprising:

- a photosensitive drum for holding an electrostatic latent image and receiving toner;
- a developing roller for applying the toner to the photosensitive drum;
- a transfer roller contacting the photosensitive drum for transferring the toner from the photosensitive drum to a recording medium;
- a recording medium delivering path extending downstream from a pickup roller toward a nip between said photosensitive drum and said transfer roller; and

a pre-transfer lamp located on a same side of the recording medium delivering path as the photosensitive drum, and located upstream of the photosensitive drum, for spreading light in a scanning direction onto the photosensitive drum, wherein said pre-transfer lamp comprises a first light-emitting diode;

said apparatus further comprising a light guide member positioned between the first light-emitting diode and the photosensitive drum for guiding light from the light-emitting diode, and for focusing the light into a line pattern in a scanning direction on the photosensitive drum.

16. The apparatus of claim 15, said light guide member having a semi-cylindrical face facing the first light-emitting diode and a semi-cylindrical face facing said photosensitive drum.

17. The apparatus of claim 16, said light guide member having an interior which is empty.

18. The apparatus of claim 16, said pre-transfer lamp further comprising a second light-emitting diode oriented to direct light into a portion of the semi-cylindrical face facing the first light-emitting diode.

19. The apparatus of claim 18, wherein said light guide member is positioned to receive a spread of light of approximately 80° emitted from each of said first and second light-emitting diodes.

20. The apparatus of claim 18, wherein there are two light-emitting diodes in the pre-transfer lamp.

21. (NEW) An image forming apparatus, comprising an electrification roller electrifying a surface of a photosensitive drum, a laser scan unit forming an electrostatic latent image on a surface of the photosensitive drum, a developing roller making the electrostatic latent image visible, a surface potential changing unit exposing the surface of the photosensitive drum to light in order to change an electric potential of the surface of the photosensitive drum,

wherein the surface potential changing unit comprises:

a light emitting element emitting light in a first direction; and
a light guide member spreading and reflecting the light toward said photosensitive drum in a second direction to direct the emitted light to the surface of the photosensitive drum.

22. (NEW) The image forming apparatus of claim 21, wherein the light guide member further comprises a light spreading member spreading the light and a reflection member reflecting the light.

23. (NEW) The image forming apparatus of claim 22, wherein the light spreading member includes a lens.

24. (NEW) The image forming apparatus of claim 22, wherein the light reflection means includes a mirror.

25. (NEW) An image forming apparatus, comprising an electrification roller electrifying a surface of a photosensitive drum, a laser scan unit forming an electrostatic latent image on the surface of the photosensitive drum, a developing roller making the electrostatic latent image visible, a surface potential changing unit exposing the surface of the photosensitive drum to light in order to change an electric potential of the surface of the photosensitive drum,

wherein the surface potential changing unit comprises:

a light emitting element emitting light in a first direction; and
a redirecting member redirecting the light in a second direction to direct the emitted light to the surface of the photosensitive drum.

26. (NEW) The image forming apparatus of claim 25, wherein the second direction is perpendicular to the first direction.

27. (NEW) The image forming apparatus of claim 26, wherein the redirecting member comprises a light spreading member spreading the light in a scan direction of the photosensitive drum.

28. (NEW) The image forming apparatus of claim 27, wherein the light spreading member focuses the light in a direction perpendicular to the scan direction.

29. (NEW) An image forming apparatus, comprising an electrification roller electrifying a surface of a photosensitive drum, a laser scan unit forming an electrostatic latent image on the surface of the photosensitive drum, a developing roller making the electrostatic latent image visible, a surface potential changing unit exposing the surface of the photosensitive drum to light in order to change an electric potential of the surface of the photosensitive drum,

wherein the surface potential changing unit comprises:

a light emitting element emitting at least one light beam in a first direction; and

a light guide member reflecting the light beam received from the light emitting element into a plurality of light beams in a second direction having an angle with the first direction to direct the emitted light to the surface of the photosensitive drum.

30. (NEW) The image forming apparatus of claim 29, wherein the light beams in the second direction are parallel with respect to each other.

31. (NEW) The image forming apparatus of claim 29, wherein the first direction of the light beam is a direction other than a direction toward the photosensitive drum.